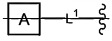
Amendments to the Claims

This listing of claims will replace all prior versions, and listing, of claims in the application.

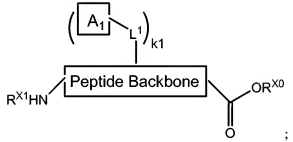
1. **(Currently Amended)** A method for preparing a ~~polyfunctionalized~~ peptide comprising a peptidic backbone made up of four or more amino acids ~~wherein two or more non-adjacent amino acids are independently substituted with a moiety having the structure:~~



~~with the proviso that the peptide sequence between any two consecutive, non-adjacent, amino acids bearing a A-L^1- moiety comprises at least one cysteine residue~~;

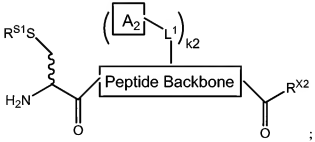
wherein the method comprises a step of:

reacting a peptide acyl donor comprising a peptidic backbone made up of two or more amino acids wherein said peptide acyl donor has the structure:



;

with a peptide amine acceptor having the structure:



;

under ~~suitable~~ reducing reaction conditions employing an excess of a reducing agent ~~to effect ligation~~;

wherein k1 and k2 are independently integers between 1 and about 20;

each occurrence of ~~A,~~ A_1 and A_2 is independently an aliphatic, heteroaliphatic, aromatic, heteroaromatic, aryl, or heteroaryl ~~or a pharmaceutically useful~~ group ~~or entity~~;

R^{S1} is a sulfide protecting group;

R^{X0} is a disulfide-substituted aryl moiety ~~group such that the moiety $-C(=O)OR^{X0}$ can be made to undergo ligation with the peptide amine acceptor~~;

each occurrence of L^1 is independently a substituted or unsubstituted, linear or branched, cyclic or acyclic, saturated or unsaturated aliphatic or heteroaliphatic moiety;

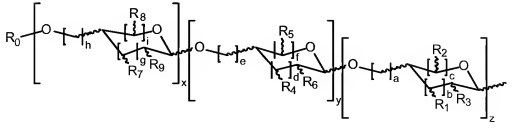
R^{X1} is hydrogen, alkyl, acyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), a nitrogen protecting group, an amino acid or a proctected amino acid;

R^{X2} is $-OR^{X2a}$ or $-NR^{X2b}R^{X2c}$, wherein R^{X2a} is hydrogen, alkyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), a carboxylic acid protecting group, an amino acid or a proctected amino acid; and R^{X2b} and R^{X2c} are independently hydrogen, alkyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), a nitrogen protecting group, an amino acid or a proctected amino acid.

2. **(Canceled)**

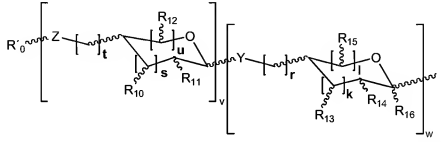
3. **(Currently Amended)** The method of claim 1, wherein each occurrence of ~~A,~~ A1 and A2 is independently a biomolecule, a small molecule, a macromolecule or a diagnostic label.

4. **(Currently Amended)** The method of claim 1, wherein each occurrence of ~~A,~~ A1 and A2 is independently a carbohydrate determinant having the structure:



wherein a, b, c, d, e, f, g, h, i, x, y and z are independently 0, 1, 2 or 3, with the proviso that the x, y and z bracketed structures represent furanose or pyranose moieties and the sum of b and c is 1 or 2, the sum of d and f is 1 or 2, and the sum of g and i is 1 or 2, and with the proviso

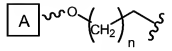
that x, y and z are not simultaneously 0; wherein R_0 is hydrogen, a linear or branched chain alkyl, acyl, arylalkyl or aryl group; wherein each occurrence of R_1, R_2, R_3, R_4, R_5, R_6 , R_7, R_8 and R_9 is independently hydrogen, OH, OR^i, NHR^i, $NHCOR^i$, F, CH_2OH, CH_2OR^i, a substituted or unsubstituted linear or branched chain alkyl, (mono-, di- or tri)hydroxyalkyl, (mono-, di- or tri)acyloxyalkyl, arylalkyl or aryl group; wherein each occurrence of R^i is independently hydrogen, CHO, $COOR^{ii}$, or a substituted or unsubstituted linear or branched chain alkyl, acyl, arylalkyl or aryl group or a saccharide moiety having the structure:



wherein Y and Z are independently NH or O; wherein k, l, r, s, t, u, v and w are each independently 0, 1 or 2; with the proviso that the v and w bracketed structures represent furanose or pyranose moieties and the sum of l and k is 1 or 2, and the sum of s and u is 1 or 2, and with the proviso that v and w are not simultaneously 0; wherein R'_0 is hydrogen, a linear or branched chain alkyl, acyl, arylalkyl or aryl group; wherein each occurrence of R_{10}, R_{11}, R_{12}, R_{13}, R_{14} and R_{15} is independently hydrogen, OH, OR^{iii}, NHR^{iii}, $NHCOR^{iii}$, F, CH_2OH, CH_2OR^{iii}, or a substituted or unsubstituted linear or branched chain alkyl, (mono-, di- or tri)hydroxyalkyl, (mono-, di- or tri)acyloxyalkyl, arylalkyl or aryl group; wherein each occurrence of R_{16} is hydrogen, COOH, $COOR^{ii}$, $CONHR^{ii}$, a substituted or unsubstituted linear or branched chain alkyl or aryl group; wherein each occurrence of R^{iii} is hydrogen, CHO, $COOR^{iv}$, or a substituted or unsubstituted linear or branched chain alkyl, acyl, arylalkyl or aryl group; and wherein each occurrence of R^{ii} and R^{iv} are each independently H, or a substituted or unsubstituted linear or branched chain alkyl, arylalkyl or aryl group.

5. **(Withdrawn)** The method of claim 1, wherein each occurrence of L^1 is independently – $O-(CH_2)_n-$, wherein n is 0-9, or a glycoside-containing moiety.

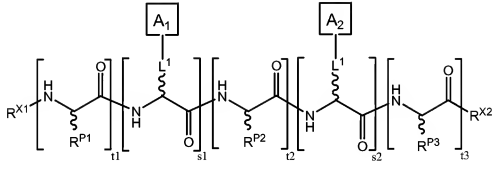
6. **(Withdrawn)** The method of claim 1, wherein L^1 is $-O-(CH_2)_n-CH_2-$ and two or more non-adjacent amino acids is/are independently substituted with a moiety having the structure:



wherein each occurrence of n is independently 0-8.

7. **(Currently Amended)** The method of claim 1, wherein each occurrence of ~~A,~~ A1 and A2 is independently selected from the group consisting of Globo-H, fucosyl GM1, KH-1, glycophorin, ~~STN~~, STn, (2,3)ST, Le^y, Le^x, N3, Tn, ~~2,6-STn,~~ 2,6-ST, Gb3 and TF.

8. **(Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide has the structure:



wherein s1 and s2 are independently an integer from 1 to about 20;

t1, t2 and t3 are each independently an integer;

R^{X1} is hydrogen, alkyl, acyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), a nitrogen protecting group, an amino acid or a proctected amino acid;

R^{X2} is $-OR^{X2a}$ or $-NR^{X2b}R^{X2c}$, wherein R^{X2a} is hydrogen, alkyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), a carboxylic acid protecting group, an amino acid or a proctected amino acid; and R^{X2b} and R^{X2c} are independently hydrogen, alkyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), a nitrogen protecting group, an amino acid or a proctected amino acid;

R^{P1}, R^{P2} and R^{P3} are independently H, alkyl, heteroalkyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), or a natural or non-natural amino acid side chain;

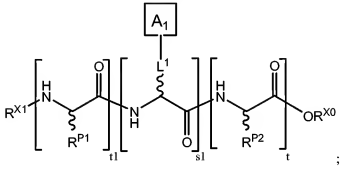
each occurrence of L^1 is independently a substituted or unsubstituted aliphatic or heteroaliphatic moiety;

A_1 and A_2 are each independently an aliphatic, heteroaliphatic, aromatic, heteroaromatic, aryl, or heteroaryl ~~or a pharmaceutically useful~~ group ~~or entity~~; and

at least one occurrence of the bracketed structure t2 is a cysteine residue or protected cysteine residue;

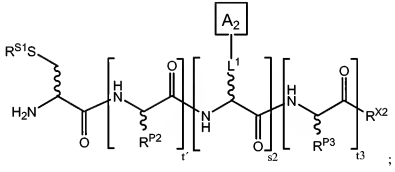
and the method comprises a step of:

reacting a peptide acyl donor having the structure:



;

with a peptide amine acceptor having the structure:

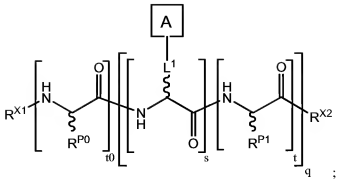


;

under ~~suitable~~ reducing reaction conditions employing an excess of a reducing agent ~~to effect ligation~~;

wherein the sum t+t′ equals (t2)+1~~; R^{S1} is a sulfide protecting group; and R^{X0} is a group such that the moiety –C(=O)OR^{X0} can be made to undergo ligation with the glycopeptide amine acceptor~~.

9. **(Currently Amended)** The method of claim 8, wherein the step of reacting the peptide acyl donor with the peptide amine acceptor is repeated a desired number of times, to prepare a ~~polyfunctionalized~~ peptide having the structure:



wherein R^{X1} and R^{X2} are as defined in claim 8;

each occurrence of A may be the same or different and may be as defined for A_1 and A_2 in claim 8;

each occurrence of R^{P1} may be the same or different and may be as defined for R^{P1} and R^{P2} in claim 8;

q is an integer greater than or equal to 2;

each occurrence of s is independently an integer from 1 to about 20;

each occurrence of t is independently an integer;

t0 is an integer; and

each occurrence of R^{P0} is independently H, alkyl, heteroalkyl, aromatic, heteroaromatic, aryl, heteroaryl, -alkyl(aryl), -alkyl(heteroaryl), or a natural or non-natural amino acid side chain.

10. **(Original)** The method of claim 9, wherein q is an integer between 2 and about 5.

11. **(Original)** The method of claim 9, wherein q is 2.

12. **(Original)** The method of claim 9, wherein the sum s+t is between about 2 and about 6.

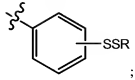
13. **(Original)** The method of claim 9, wherein t0 is an integer from 0 to about 20.

14. **(Original)** The method of claim 9, wherein R^{X1} is hydrogen, Fmoc or Ac.

15. **(Original)** The method of claim 9, wherein R^{X2} is NH_2.

16. **(Cancelled)**

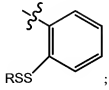
17. **(Original)** The method of claim 9, wherein R^{X0} has the structure:



;

wherein R is an aliphatic, heteroaliphatic, aromatic or heteroaromatic moiety.

18. **(Original)** The method of claim 17, wherein R^{X0} has the structure:



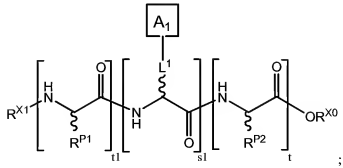
;

wherein R is lower alkyl.

19. **(Original)** The method of claim 18, wherein R is ethyl.

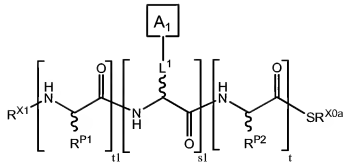
20. **(Original)** The method of claim 9, wherein R^{S1} is -S*t*Bu.

21. **(Currently Amended)** The method of claim 9, wherein in the step of reacting the peptide acyl donor having the structure:



;

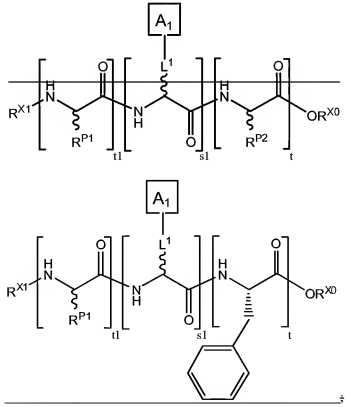
with the peptide amine acceptor ~~under suitable conditions to effect ligation~~, an intermediate having the following structure is formed in situ:



wherein R^{X0a} is an oxygen-substituted aryl moiety.

22. **(Currently Amended)** The method of claim 21, wherein the ~~suitable conditions to effect ligation comprise~~ reducing agent is 2-mercaptoethanesulfonic acid, sodium salt ~~MESNa~~.

23. **(Currently Amended)** The method of claim 9, wherein ~~in~~ the peptide acyl donor ~~having~~ has the structure:



~~the amino acyl residue directly attached to OR^{X0} is phenylalanine~~.

24. **(Withdrawn/Currently Amended)** The method of claim 1, wherein ~~when~~ at least one occurrence of ~~A (or~~ A_1 ~~and~~/or A_2~~, as further defined for A)~~ is a carbohydrate domain, and some or all of carbohydrate domains are O-linked to the peptide backbone.

25. **(Currently Amended)** The method of claim 1, wherein ~~when~~ at least one occurrence of ~~A (or~~ A_1 ~~and~~/or A_2~~, as further defined for A)~~ is a carbohydrate domain, and some or all of carbohydrate domains are N-linked to the peptide backbone.

26. **(Withdrawn/Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide is symmetrical.

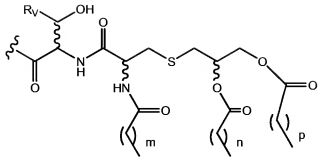
27. **(Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide is nonsymmetrical.

28. **(Withdrawn/Currently Amended)** The method of claim 1, further comprising a step of conjugating the ~~polyfunctionalized~~ peptide to an immunogenic carrier.

29. **(Withdrawn)** The method of claim 28, wherein the carrier is a protein, a peptide or a lipid.

30. **(Withdrawn)** The method of claim 28, wherein the carrier is Bovine Serum Albumin (BSA), Keyhole Limpet Hemocyanin (KLH) or polylysine.

31. **(Withdrawn)** The method of claim 28, wherein the carrier is a lipid carrier having the structure:

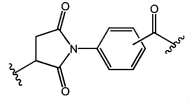


wherein m, n and p are each independently integers between about 8 and 20; and R_V is hydrogen, substituted or unsubstituted linear or branched chain lower alkyl or substituted or unsubstituted phenyl.

32. **(Withdrawn)** The method of claim 31, wherein m′, n′ and p′ are each 14.

33. **(Withdrawn/Currently Amended)** The method of claim 28, wherein the carrier is linked to the ~~polyfunctionalized~~ peptide through a crosslinker.

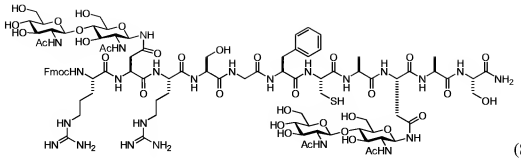
34. **(Withdrawn/Currently Amended)** The method of claim 33, wherein the crosslinker is a fragment having the structure:



;

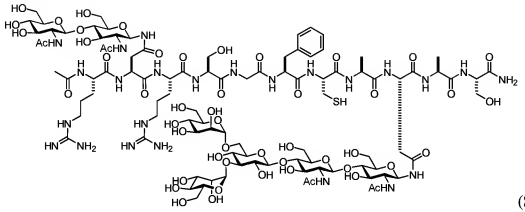
whereby said structure is generated upon conjugation of a maleimidobenzoic acid N-hydroxy succinimide ester with a suitable functionality on the ~~polyfunctionalized~~ peptide.

35. **(Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide has the structure:



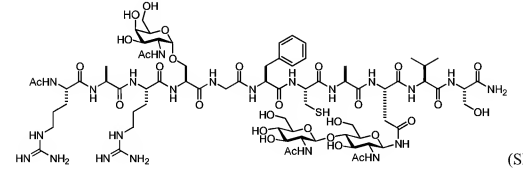
(SEQ ID NO: 6).

36. **(Withdrawn/Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide has the structure:



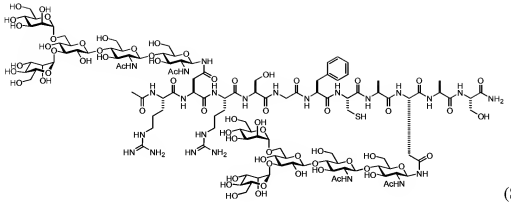
(SEQ ID NO: 6).

37. **(Withdrawn/Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide has the structure:



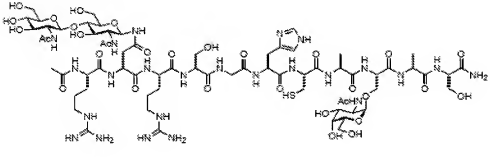
(SEQ ID NO: 7).

38. **(Withdrawn/Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide has the structure:



(SEQ ID NO: 6).

39. **(Withdrawn/Currently Amended)** The method of claim 1, wherein the ~~polyfunctionalized~~ peptide has the structure:



(SEQ ID NO: 8).

40. **(Cancelled)**